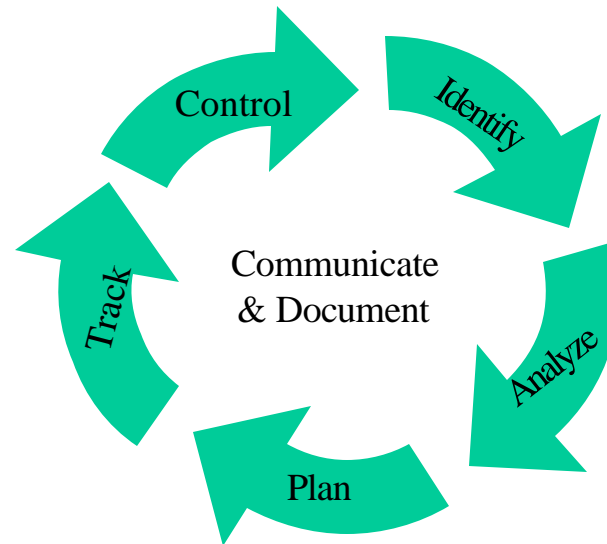# Risk Management

Continuous Risk Management

Risk Management is a continuous process that identifies risks; analyzes their impact and prioritizes them; develops and carries out plans for risk handling; tracks risks and the implementation of mitigation plans; supports informed, timely, and effective decisions to control risks and mitigation plans; and assures that risk information is communicated and documented.

Defining Risk

Risk is defined as the likelihood of an undesirable scenario occurring and the significance of the consequence of its occurrence. Risk may also be defined as a possibility of loss or injury.

Risk is defined by two characteristics: probability or likelihood (L) of occurrence and consequence (C) of occurrence. This is expressed as R = L x C.

Risk Identification

Risk identification should be discrete and continuous. Periodic risk evaluations should be conducted to identify risks; however, a continuous process should be established to regularly review available information in order to identify risks.

Once the risk has been identified, the appropriate management level should assign a risk owner. The risk owner has the overall responsibility for risk management activities until final closure of the risk.

Risk Identification, cont'd

Once the risk owner is assigned, preliminary risk definition activities can begin. In this phase, the risk evaluators ask three basic questions to help define the risk:

a. What can happen?

b. How likely is it?

c. What are the consequences?

Risk Identification, cont'd

It is critical to establish a clear definition of the risk to be assessed. This is accomplished through the risk statement, which clarifies what conditions give rise to the potential for undesired consequences or impact. The risk statement or supporting context should describe the timeframe of the risk being assessed.

Conditions – represent facts or plausible scenarios that are currently known and cause concern. In order to fully understand the risk, it is important to minimize or eliminate the uncertainty surrounding the conditions driving the risk.

Risk Identification, cont'd

Consequences – represent an undesired outcome or impact that could occur if no additional action is taken to address the current condition.

Therefore, the risk statement can be defined using the following format:

Given the **Condition (X),** there is a possibility that **Consequence (Y)** will occur.

The clarity of the risk statement is vital to the accuracy of the risk analysis and the communication of the results.

Risk Analysis

Risk analysis refers to the activities aimed at studying risks in order to better understand their significance in terms of likelihood, consequence, and urgency. In many cases, the risk owner will be able to assign likelihood, consequence, and timeframe scores based on current knowledge; however a more detailed risk analysis is necessary to determine likelihood and consequence(s) of a given risk.

Risk Analysis, cont'd

Risk Scorecard

In order to be consistent in risk ranking, a risk scorecard may be developed. Examples are 3 by 3 or 5 by 5 (shown below).

$R = L \times C$

Risk Analysis, cont'd

There are many methods and tools for performing risk assessments; some rely on qualitative assessments and others utilize quantitative techniques. The complexity of the assessment methods should correspond to the need for, and cost/benefit of, the desired information. In some cases, a qualitative examination of the known data may provide enough information to determine the required risk handling strategy. In some cases, however, more elaborate quantitative risk assessment methods such as probabilistic modeling or reliability analysis may be desired.

Risk Analysis, cont'd

Risks should be evaluated in order to determine their urgency. Urgency simply implies time for action. The following is some criteria to consider:

Near Term – action must be taken or be impacted by the risk in 90 days

Mid Term – action must be taken or be impacted by the risk in the next 90 – 180 days

Long Term – action must be taken or be impacted by the risk beyond 180 days

Risk Planning

Risk planning is the process used to develop candidate strategies and options for handling the risk, which depend on the urgency of the risk, the complexity of the risk, and the risk level. There are many strategies for handling risks, including risk elimination, risk mitigation, and risk acceptance.

Risk Planning, cont'd

Risk Elimination

In sustaining and operational environments, risk elimination is typically achieved by defining a proactive risk handling plan that completely eliminates a previously identified risk. Risk elimination can be achieved through a series of planned steps over a period of time designed to gradually reduce, or mitigate, the risk to a point where it is eventually eliminated. In developing handling plans to eliminate a previously identified risk, consideration is given to the amount of resources required to eliminate the risk versus mitigating the risk to a safe and manageable level.

Risk Planning, cont'd

Risk Elimination, cont'd

In a design and development environment, risk elimination (or avoidance) can typically be achieved by reviewing the design and operational aspects of a product and removing requirements that induce uncertainty or increase risk. This implies trading off risks for performance or other capability. Avoidance requires an understanding of priorities in requirements and constraints and of whether the requirement is critical, product enhancing, or simply a "nice to have."

Risk Planning, cont'd

Risk Mitigation

In sustaining and operational environments, risk mitigation is achieved in the same manner as risk elimination; however instead of completely eliminating the risk, a decision is made by management to implement a risk handling plan that reduces the risk to a safe and acceptable level by either reducing its likelihood, or lowering the consequence of the risk (or both) if it were to come to pass.

Risk Planning, cont'd

Risk Mitigation, cont'd

In a design and development environment, risk mitigation (or control) describes deliberate use of the design process to lower the risk to acceptable levels. This can be accomplished through reduction in likelihood, reduction in consequences, or a combination of both. Risk mitigation requires a disciplined execution of the systems engineering process and detailed knowledge of the technical area associated with the design that is at risk.

Risk Planning, cont'd

Risk Acceptance

Risk acceptance is the deliberate decision to assume a risk that is low enough in likelihood and consequence to be reasonably absorbed without impacting safety, or the overall process/activity. A decision on the part of management to accept a risk should be deliberate and the criteria for this decision documented.

Risk Planning, cont'd

Risk Handling Plan Development

The general process for developing risk handling plans is to identify strategies for risk handling (including specific tasks and schedule, cost and schedule impacts, impacts to other projects or disciplines, an assessment of the risk associated with the strategy itself, and projected risk burn down schedule as a function of risk handling plan milestones) and recommend the risk handling plan and present it to the decision maker for approval.

Risk Planning, cont'd

Risk Status

Once risks are defined, one of three statuses are generally maintained:

Open – proactive efforts are in work to prevent or mitigate a risk.

Closed – a risk that will no longer be actively mitigated or handled. These are risks that have been reduced to a level where the residual risk is considered negligible and further risk reduction activity is deemed unnecessary. Closure rationale must be defined and approved to be closed.

Risk Planning, cont'd

Risk Status, cont'd

Accepted – accepted risks have residual risk but continued efforts to prevent or mitigate are not deemed practical. Accepted risks will be reviewed periodically to reevaluate acceptance rationale and to assure that risk controls remain effective.

Risk Tracking

Once the handling plan is approved, risk handling activities will be initiated and risks tracked as appropriate by the owning organization. The owning organization monitors progress and regularly updates risk status and information. An electronic tracking system may be used to automate tracking, status updates, and reports on risks.

Risk Control

Risk control is a feedback process where risk handling plans may be revised or updated based on observation or other status updates. Once a risk handling plan is implemented, it must be monitored to determine if the original plan is effective. If the plan is not effective, alternate plans must be put in place to ensure that the risk is appropriately handled.

Risk Communication & Documentation

Risk communication and documentation is inherent in each of the Continuous Risk Management processes as described above.